

1 IN THE CLAIMS:

2 Claim 19 is amended herewith.

3 Claims 1-18 and 21 are cancelled herewith.

4 New claims 23-38 are submitted herewith.

5 Thus, claims 19-20 and 22-38 are pending as of this Response.

8 **1-18. (Cancelled).**

1           **19. (Currently Amended)** A method implemented at least in part by a  
2 computing device for adding a new entity having a rank within a plurality of N  
3 ranks to a plurality of entities as represented in a data structure for efficiently  
4 ordering the entities, the entities also having respective ranks within the plurality  
5 of N ranks, the method comprising:

6           of a plurality of array entries of an array having fewer than N entries over  
7 which the plurality of N ranks are distributed, such that the array entries  
8 correspond to respective ranges of ranks, determining a particular array entry  
9 corresponding to a range of ranks in which the rank of the new entity lies;

10           adjusting the particular array entry ~~having the corresponding range of ranks~~  
11 ~~into which the rank of the new entity lies~~ to point to the new entity in response to  
12 determining that the particular array entry currently points to null;

13           adjusting the particular array entry ~~having the corresponding range of ranks~~  
14 ~~into which the rank of the new entity lies~~ to point to the new entity in response to  
15 determining that the particular array entry ~~current~~ currently points to an entity  
16 having a rank less than the rank of the new entity;

17           linking the new entity into a vertically linked list linking in at least one  
18 direction a corresponding subset of the plurality of entities having an identical  
19 rank, in response to determining that the rank of the new entity is equal to the rank  
20 of any other entity within the plurality of entities; and

21           otherwise, linking the new entity into a horizontally linked list linking at  
22 least a subset of the plurality of entities in at least a descending rank order  
23 direction, the entities in the horizontally linked list having unique ranks as  
24 compared to the ranks of other entities in the horizontally linked list[[.]], wherein

1       at least one entity of the plurality of entities is a thread, the rank of the entity is a  
2       priority for the thread, and the array is a priority queue.

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4       **20. (Original)** The method of claim 19, further comprising adjusting  
5       a head pointer pointing to an entity having a greatest rank of the plurality of ranks  
6       of the plurality of entities to point to the new entity in response to determining that  
7       the rank of the new entity is greater than the rank of the entity of the plurality of  
8       entities to which the head pointer currently points.

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10      **21. (Cancelled).**

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12      **22. (Original)** The method of claim 19, wherein the method is  
13      performed by execution of a computer program stored on a machine-readable  
14      medium by a processor.

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1           **23. (New)** A machine-readable medium having a data structure stored  
2 thereon, the data structure configured to be accessible by a computer, the data  
3 structure comprising:

4           a plurality of entities having respective ranks within a plurality of N ranks,  
5 at least one of the entities being a thread having a rank that is a priority for the  
6 thread;

7           a horizontally linked list of at least a subset of the plurality of entities, each  
8 of the entities in the horizontally linked list having a respective unique rank  
9 relative to the ranks of other entities in the horizontally linked list, the horizontally  
10 linked list arranged in rank order; and

11           an array having a plurality of fewer than N array entries, the array entries  
12 associated with respective ranges of the N ranks, at least one of the array entries  
13 pointing to an entity having a greatest rank that is within the range of ranks  
14 associated with the at least one array entry, wherein the array is a priority queue.

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16           **24. (New)** The machine-readable medium of claim 23, the data structure  
17 further comprising a vertically linked list of a subset of the plurality of entities  
18 having identical rank.

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20           **25. (New)** The machine-readable medium of claim 24, wherein the  
21 vertically linked list links the subset of entities in a first vertical direction and in a  
22 second vertical direction.

1           **26. (New)** The machine-readable medium of claim 23, the data structure  
2 further comprising a head pointer, the head pointer pointing to an entity having a  
3 greatest rank relative to the ranks of the other entities in the data structure.

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5           **27. (New)** The machine-readable medium of claim 23, wherein the  
6 horizontally linked list is arranged in ascending rank order.

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8           **28. (New)** The machine-readable medium of claim 23, wherein the  
9 plurality of N ranks are equally distributed over the plurality of array entries.

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11           **29. (New)** The machine-readable medium of claim 23, wherein at least  
12 two entities having respectively different ranks correspond to the associated range  
13 of ranks of one of the array entries.

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15           **30. (New)** The machine-readable medium of claim 23, wherein at least  
16 one of the array entries points to null indicating that no entity corresponds to the  
17 range of ranks associated with the at least one array entry.

1           **31. (New)** A method implemented at least in part by a computing  
2 device, the method for removing a particular entity from a plurality of entities of a  
3 data structure, the entities having respective ranks within a plurality of N ranks,  
4 the data structure including an array of one or more array entries, the method  
5 comprising:

6           in response to determining that the particular entity is present within a  
7 vertically linked list of a subset of the plurality of entities having an identical rank,  
8 delinking the particular entity from the vertically linked list;

9           in response to determining that the particular entity is present within a  
10 horizontally linked list of a subset of the plurality of entities arranged in a rank  
11 order, delinking the particular entity from the horizontally linked list;

12           in response to determining that one of the array entries points to the  
13 particular entity, adjusting the array entry to point to one of null and another one  
14 of the plurality of entities; and

15           storing the data structure on a single machine-readable medium accessible  
16 by the computing device, wherein at least one of the entities is a thread having a  
17 rank that is a priority for the thread, and wherein the array is a priority queue.

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19           **32. (New)** The method of claim 31, wherein the one or more array  
20 entries have respective ranges of ranks, and adjusting the array entry further  
21 comprises:

22           in response to determining that the particular entity was present within the  
23 vertically linked list, adjusting the array entry to point to a next entity within the  
24 vertically linked list.

1           **33. (New)** The method of claim 32, wherein adjusting the array entry  
2 further comprises:

3           otherwise, in response to determining that the particular entity was present  
4 within the horizontally linked list, and that the rank of a next entity within the  
5 horizontally linked list is within the corresponding range of ranks for the array  
6 entry, adjusting the array entry to point to the next entity within the horizontally  
7 linked list.

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9           **34. (New)** The method of claim 33, wherein adjusting the array entry  
10 further comprises:

11           otherwise, adjusting the array entry to point to null.

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13           **35. (New)** The method of claim 31, further comprising:  
14           in response to determining that a head pointer points to the particular entity,  
15 adjusting the head pointer to point to another one of the plurality of entities.

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17           **36. (New)** The method of claim 35, wherein adjusting the head pointer  
18 comprises:

19           in response to determining that the particular entity was present within the  
20 vertically linked list, adjusting the head pointer to point to a next entity within the  
21 vertically linked list.

1       **37. (New)** The method of claim 36, wherein adjusting the head pointer  
2 comprises:

3               otherwise, in response to determining that the particular entity was present  
4 within the horizontally linked list, adjusting the head pointer to point to a next  
5 entity within the horizontally linked list.

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7       **38. (New)** The method of claim 31, wherein the method is performed by  
8 execution of a computer program stored on a machine-readable medium by a  
9 processor.

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